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09/733,364	12/08/2000	Jason Keith Redi	00-4035	1961

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EXAMINER	
MARCELO, MELVIN C	

ART UNIT	PAPER NUMBER
2663	5

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/733,364	REDI ET AL.	
	Examiner	Art Unit	
	Melvin Marcelo	2663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 December 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *34-48* is/are allowed.

6)☒ Claim(s) *1,2,5-9,14,15,18-33 and 49-51* is/are rejected.

7)☒ Claim(s) *3,4,10-13,16 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claim 45 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 45, lines 1-2, "the side information" lacks a proper antecedent basis to claim 38. See claim 44.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the

prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 23-25, 27-29, 31, 49 and 50 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Krishnamurthy et al. (US 6,735,448 B1).

With respect to the claims below, Krishnamurthy teaches the particular method and apparatus in the following sections: column 5, lines 7-39; column 7, line 24 to column 8, line 14; and column 9, lines 13-31. Krishnamurthy measures the signal strength or alternatively the attenuation of Pmax transmissions (column 7, lines 25-27), wherein the Pmax transmissions are the beacon packets (column 7, lines 35-37). These measurements are used to update local connectivity tables using transmit power level as the link cost (column 7, lines 65-67). Since the value of the transmit power level is based on received signal strength or the alternative attenuation data, the transmit power level is then representative of both received signal strength and energy attenuation data. The local connectivity table containing the transmit power level is distributed to the other nodes in the ad-hoc network (column 8, lines 1-14). Minimum power

routing is used to determine the lowest energy path for routing a message

(column 9, lines 13-31).

23. A method of conserving energy in a wireless ad-hoc network, the network comprising a plurality of communication nodes, each node including a transmitter and receiver, the network including a plurality of communication links between the nodes, said method comprising the steps of: determining energy attenuation data for messages transmitted over the links; distributing the energy attenuation data to the communication nodes; and determining a network routing path comprising a lowest energy path and routing a message via the lowest energy path.

24. A method of conserving energy in a wireless ad-hoc network, the network comprising a plurality of communication nodes, each node including a transmitter and receiver, the network including a plurality of communication links between the nodes, said method comprising the steps of: determining a minimum transmission level for each of the links; distributing the minimum transmission levels to the communication nodes; and determining a network routing path comprising a lowest energy path based on the minimum transmission levels and routing a message via the lowest energy path.

25. In a communications system for communication in a network having a plurality of nodes, each node including transmitting and receiving means, the network including a plurality of communication paths among the nodes, a method of operating a network comprising the steps of: determining an energy requirement for each of the plurality of communication paths; selecting a communications path having a lowest energy requirement to route a message; and routing the message via the selected communications path.

27. The method according to claim 25, wherein the energy requirement comprises a transmission power level.

28. In a communications system for communication in a network having a plurality of nodes, each node including transmitting and receiving means, the network including a plurality of paths among the nodes, each path comprising at least one communications link, a method of operating a network comprising the steps of: estimating an energy requirement across each of the communications

links; distributing the energy requirements to the plurality of nodes; routing a message over a selected communications path, the path being selected based on a total energy requirement of the path.

29. The method according to claim 28, wherein the selected path has the lowest total energy requirement.

31. The method according to claim 28, wherein the energy requirement comprises a transmission power level.

49. A method of routing signals in a network, the network including a plurality of members, each member adapted to transmit and receive signals, said method comprising the steps of: receiving at a first member of the plurality of members a signal transmitted from a second member of the plurality of members; determining power data corresponding to the received signal; calculating a transmission power level for transmitting a signal from the first member to the second member based at least in part on the power data; distributing the transmission power level to at least some of the plurality of members; and routing messages based at least in part on distributed transmission power levels.

50. The method according to claim 49, wherein the power data includes a received power level signal.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 2, 5-9, 14, 15, 18-22, 26, 30, 32, 33 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamurthy et al.

With respect to claims 1, 14, 26 and 30, Krishnamurthy does not teach the use of path loss information that is distributed in the network to determine the route for messages. In Krishnamurthy, the transmit power level is the link cost that is distributed to the nodes in order to determine the lowest energy route (see above 102 rejection). However, Krishnamurthy teaches that an individual node keeps track of its neighbors by measuring signal strength or alternatively attenuation of the beacon transmissions (column 7, lines 24-27). Attenuation data is path loss information. A skilled artisan would have been motivated to distribute the path loss information for the reason that the transmit power level is based on the attenuation data and that Krishnamurthy teaches that signal strength (i.e. power level) and attenuation data are alternatives. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to distribute path loss information such as attenuation data since Krishnamurthy teaches that signal strength and attenuation data are alternatives.

With respect to claims 2, 15, 26 and 51, Krishnamurthy does not teach the use of RSSI to measure the signal strength. However, RSSI is a standard in the art representing Received Signal Strength Indication.

Therefore, it would have been obvious to use RSSI in Krishnamurthy since a skilled artisan would have been motivated to adopt a prior art standard in measuring the signal strength of received signals.

With respect to claim 32, Krishnamurthy teaches an ad-hoc network, wherein each node functions as a router in order to transmit a message from a source to a destination node. Krishnamurthy does not teach the method as computer code. However, it would have been obvious to provide Krishnamurthy's method as computer code since a skilled artisan would have been motivated to provide an easily distributable form for the method.

1. A communications node in a network including a plurality of nodes, said communications node including a transceiver to transmit and receive messages and having at least one communications link with a first node of the plurality of nodes, said communications node comprising: an electronic memory circuit having network information stored therein; and an electronic processor circuit which (i) determines path loss information across the at least one communications link by evaluating power data corresponding to a message received from the first node; (ii) distributes the path loss information to the network; and (iii) routes messages to the network based on path loss information.

2. A communications node according to claim 1, wherein the power data comprises a received signal strength indication (RSSI).

5. A communications node according to claim 1, wherein the power data comprises a received power signal.

6. A communications node according to claim 1, wherein the message from the

first node comprises a power transmission level and said electronic processor circuit determines the path loss based at least in part on the power transmission level.

7. A communications node according to claim 6, wherein said electronic processor circuit determines a minimum power level for transmission to the first node.

8. A communications node according to claim 1, wherein the network includes a plurality of communication links among the plurality of nodes, and said network information comprises path loss data associated with each of the communication links.

9. A communications node according to claim 8, wherein said electronic processor circuit routes a message through the network to a destination node via a route having a lowest path loss.

14. A method of operating a communications node in a network including a plurality of nodes, the communications node including a transceiver to transmit and receive messages, the communications node having at least one communications link with a first node of the plurality of nodes, said method comprising the steps of: determining path loss information across the at least one communications link by evaluating power data corresponding to a received signal from the first node; distributing the path loss information to the network; and routing messages to the network based on path loss information.

15. A method according to claim 14, wherein the power data comprises a received signal strength indication (RSSI).

18. A method according to claim 14, wherein the power data comprises a received power signal.

19. A method according to claim 14, wherein the received signal from the first node comprises a power transmission level, and said method further comprises the step of determining the path loss based at least in part on the power transmission level.

20. A method according to claim 19, further comprising the step of determining

a minimum power level for transmission to the first node.

21. A method according to claim 14, wherein the network includes a plurality of communication links among the plurality of nodes, and said method further comprises the step of storing path loss data associated with at least one of the communication links.

22. A method according to claim 21, further comprising the step of routing a message through the network to a destination node via a route having a lowest path loss.

26. The method according to claim 25, wherein the energy requirement comprises path loss data.

30. The method according to claim 28, wherein the energy requirement comprises path loss data.

32. Computer executable code stored on a computer readable medium, the code to operate a communications router in a communications network, the network including a plurality of communication routers and a plurality of communications links, said code comprising: code to determine energy information associated with at least some of the plurality of communication links; code to distribute the energy information to at least some of the routers; and code to determine a network routing path having a lowest energy based at least in part on the energy information.

33. A communications node in a network including a plurality of nodes, said communications node including a transceiver to transmit and receive messages, said communications node having at least one communications link with a first node of the plurality of nodes, said communications node comprising: means for storing network information; means for determining a path loss across the at least one communications link by evaluating power data corresponding to a message received from the first node; means for distributing the path loss information to the network; and means for routing messages to the network based on path loss information.

51. The method according to claim 49, wherein the power data includes a received signal strength indicator.

Allowable Subject Matter

6. Claims 3, 4, 10-13, 16 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

3. A communications node according to claim 2, wherein said electronic processor circuit determines the path loss by subtracting the RSSI from a predetermined maximum power.

4. A communications node according to claim 3, wherein said electronic processor circuit determines a minimum power level for transmission to the first node.

10. A communications node according to claim 1, wherein the network information stored in said electronic memory circuit comprises trace records.

11. A communications node according to claim 10, wherein said trace records are opaque with respect to said communications node.

12. A communications node according to claim 10, wherein the trace records comprise operating parameters for the transceiver.

13. A communications node according to claim 12, wherein said electronic processor circuit i) accesses the trace records through standardized software library calls via predefined common sets of names; and ii) uses predetermined software for internally manipulating predetermined trace records.

16. A method according to claim 15, wherein the path loss is determined by subtracting the RSSI from a predetermined maximum power.

17. A method according to claim 16, further comprising the step of determining a minimum power level for transmission to the first node.

7. Claims 34-48 are allowed.

34. A method of operating a communications router in an ad-hoc wireless network including a plurality of routers, the method comprising the steps of: obtaining a received signal strength indicator (RSSI) for a message received from a first router of the plurality of routers; determining a power level requirement for a message transmission between the communications router and the first router by subtracting the RSSI from a transmission power level of the first router; and distributing the power level requirement to at least some of the routers in the network.

35. A method according to claim 34, wherein the power level of the first router is a predetermined power level.

36. The method according to claim 34, wherein the power level of the first router is provided in the message from the first router.

37. The method according to claim 34, further comprising the steps of: receiving power level requirements from the plurality of network nodes; and selecting routing paths based on the power level requirements so as to minimize a network energy expenditure.

38. A method of estimating instantaneous minimum transmission power to close a link in a wireless network between a first node and a second node of a plurality of communication nodes with each node including transmitting means and receiving means, said method comprising the steps of: monitoring by the first node, transmission signals from at least the second node in the network; filtering energy data corresponding to the transmission signal with a linear predictive filter; and outputting from the linear predictive filter a signal corresponding to a transmission energy requirement.

39. A method according to claim 38, wherein the energy data is a received

signal strength indicator.

40. A method according to claim 38, wherein the energy data is a received power level.

41. A method according to claim 38, wherein the energy data is path loss data.

42. A method according to claim 38, wherein the energy requirement is a minimal transmit power level to transmit a signal from the first node to the second node.

43. A method according to claim 38, further comprising the step of distributing the energy requirement to the plurality of nodes.

44. A method according to claim 38, wherein the transmission signals monitored by the first node comprise side information.

45. A method according to claim 38, wherein the side information comprises data received from a third node of the plurality of nodes.

46. A communications node for estimating instantaneous minimum transmission power to close a link in a wireless network between said communications node and a first node of a plurality of communication nodes with each node including transmitting means and receiving means, said apparatus comprising: means for monitoring transmission signals from at least the first node in the network; and means for filtering energy data corresponding to the transmission signal, and for outputting a signal corresponding to a transmission energy requirement.

47. A communications node according to claim 46, wherein the monitored transmission signals comprise side information.

48. A communications node according to claim 47, wherein the side information comprises data received from a second node in the network.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Marcelo whose telephone number is 703-305-4373. The examiner can normally be reached on Mon-Fri 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chau Nguyen can be reached on 703-308-5340. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Melvin Marcelo
Primary Examiner
Art Unit 2663

July 12, 2004